NEW FORM OF CONSTRUCTION OF OBJECT-GLASSES INTENDED FOR STELLAR PHOTOGRAPHY.

THE interest now generally taken in stellar photography will probably make it desirable that the object-glasses of telescopes ordinarily used for visual purposes should be so constructed as to be readily adapted to photographic use. As now commonly made, the correction for chromatic aberration by means of the flint-glass lens of a refracting telescope is too great to give satisfactory photographic images. The method of adapting such a telescope to photographic purposes which was employed by Mr. Rutherford, and more recently in the case of the great telescope of the Lick Observatory, is to provide an additional convex lens of long focus which may be mounted when photographs are to be taken, and removed when direct observation is desired. The objections to this method are the expense of the additional lens and the introduction of two more surfaces.

Another way of removing the excessive correction for chromatic aberration is to separate the flint- and crown-glass lenses, and to place the flint nearer the eye-piece. But when this is done, while the correction for colour becomes satisfactory, the spherical aberration is only partially corrected, the focal length of the central part of the object-glass being greater than that of the surrounding portions. This difficulty, however, may be surmounted by giving different curves to the two surfaces of the crown-glass lens, and reversing it when the lenses are separated.

In an object-glass of this construction, when used for direct observation, the two lenses are in contact, with the more convex side of the crown lens next the flint. For photographic use, the lenses are separated, and the more convex side of the crown-glass lens is turned outwards. In order to determine whether this principle of construction should be adopted in the case of a large object-glass to be made for experimental work undertaken with the aid of the Boyden Fund, recently transferred to the Observatory of Harvard College, for the purpose of obtaining astronomical observations at elevated stations, a small object-glass was made upon the new plan by Messrs. Alvan Clark and Sons. As this object-glass proved to be well adapted to its purpose, the larger object-glass above mentioned has been similarly constructed by the same makers; its aperture is 13 inches, and its focal length about 180 inches. Upon trial, it is found that the images formed by this object-glass are excellent when the instrument is used for direct observation, and that the photographic images are equally good when the lenses are separated 3 inches and the crown-glass reversed.

The curvature given to the surfaces of such an object-glass will depend upon the quality of the glass employed; in this particular instrument the radius of curvature for the less convex side of the crown-glass is 86 inches; for the more convex side, 77 inches; for the concave side of the flint, 73·8 inches; the side of the flint-glass which is turned towards the eye-piece is convex, and its radius of curvature is 1020 inches.

EDWARD C. PICKERING.

Harvard College Observatory, Cambridge, U.S.,
September 29.

WILLIAM S. SYMONDS.

WE have already announced the death, on September 15, at Cheltenham, of the Rev. William S. Symonds, Rector of Pendock, F.G.S., and a J.P. for the county of Worcestershire. Mr. Symonds, the eldest son of Mr. William Symonds, of Elsdon, Hereford, was born in Hereford in 1818, took his degree at Christ's College, Cambridge, in 1842, and in 1868 was presented to the Rectory of Pendock.

For several years past Mr. Symonds had suffered from heart-disease, and was compelled to withdraw from his parish duties, as well as from participation in those scientific pursuits in which he had long been actively occupied.

The intimate friend of Murchison, Lyell, and of other pioneers in geology, and frequently their companion in their excursions, he enjoyed exceptional opportunities for observing the facts relating to this science, and has contributed numerous papers, chiefly on the rocks and fossils of the west of England, to the scientific periodicals. Yet he sometimes engaged in discussions of a more general character. In the question of the reptiliferous sandstone of Elgin he took much interest. Before the meeting of the British Association at Aberdeen, in 1859, he visited the Elgin area, and, having worked over it with great care, was led to accept the views of Sir C. Lyell in opposition to those of Murchison; and in the discussions at the meeting strongly insisted on the view that the reptiliferous sandstones are of the New Red or Triassic, and not of the Old Red Sandstone age.

Mr. Symonds did not devote as much attention to palæontology as to physical geology, although even in this branch of the science he has left his mark, and has made numerous and valuable contributions from his collections of fossils to several local museums.

During the latter part of his life his interest was much concentrated on the phenomena of the glacial drifts, and the question of the antiquity of prehistoric man. In 1871 he communicated to the *Geological Magazine* (p. 433) a paper on the great Doward Caves, and in his "Severn Straits, or, Notes on Glacial Drifts," he gives his conclusions on this subject.

But it is perhaps chiefly as an earnest and eloquent expounder of the facts and principles of geology and cognate subjects that he will be remembered. He had a remarkable power of infusing his own spirit of research and love of Nature into his writings. Few can read his "Records of the Rocks," "Old Stones," and "Old Bones," or his delightful romances of "Malvern Chase" and "Hornby Castle"—tales of the Wars of the Roses and the Parliament—without recognizing this. In the formation and management of many of the field clubs of the west of England Mr. Symonds's ability was especially conspicuous. He was engaged, with the late Mr. Scobie, of Hereford, in the formation of the Woolhope Field Club, and was elected its President in 1854. He was the frequent companion of the late Sir William Govin in his travels, and took an active part in the management of the Cotteswold Club, of which Sir William was President.

By those who had the privilege of an intimate acquaintance with Mr. Symonds, he will ever be thought of and respected as an earnest and most uncompromising seeker after truth for its own sake. He considered that man is performing a most religious duty when he sits as a humble student at the feet of Nature to learn, as far as may be, the lessons which Nature's Creator would teach him. It was a faith, too, which, throughout the trying and painful complaint that clouded the last days of his life, never failed him, and which enabled him to look forward to, and speak of, the great change which was before him, with cheerful hope.

The number of papers which Mr. Symonds has from time to time contributed to various scientific journals appears to have been over forty.

NOTES.

WE reprint to-day from the *Times* an admirable letter by Mr. Samuel Smith on education in Germany. Mr. Smith gives a clear account of some important elements of the educational system which the Germans are gradually bringing to perfection;

and no one who reads what he has to say will be surprised that in many departments of industry our manufacturers are being surpassed by their Teutonic rivals. The letter contains nothing new; but the essential facts connected with this vital subject cannot be too often pressed on the attention of the public.

We regret to announce the death of Mr. Joseph Baxendell, F.R.S., of the Observatory, Birkdale, Southport. He died at the age of seventy-two.

According to a report which appears in the *Mouvement Géographique*, Kilimanjaro has at last been ascended to its summit. This has been done by a German traveller, M. Meyer, of Leipzig. We know that the mountain presents two great peaks:—Kimawenzi, 4973 metres in height, and Kibo, estimated by Mr. H. H. Johnston at 5745 metres. Mr. Johnston succeeded in ascending the latter to a height of 4950 metres. M. Meyer, it is stated, has succeeded in reaching the crater summit of Kibo, which he estimates at 6000 metres. Before giving absolute credence to these statements, it will be well to await the publication of details by M. Meyer.

In an interesting article in the *Times* on Monday, on "The British Race-Types of To-day," it was stated that "for a generation or more the advocates of the view that the English are almost unmixed Teutons pressed their ideas upon the scientific and literary world with a persistence and learning which went far to produce conviction." Prof. Huxley, writing to the *Times* about this statement, maintains that, whatever may have been the case with "the literary world," scientific anthropologists were never misled by the "persistence and learning" of those who contended that the English are of almost purely Teutonic origin. "A score of years ago," says Prof. Huxley, "this question was hotly debated; and I do not think that, at that time, any of my anthropological colleagues would have found much fault with the propositions laid down in a paper 'On some Fixed Points of British Ethnology,' which was published in 1871, which propositions are in substance corroborated by the writer of your article."

Capt. Dickinson, who has been in charge of the Royal Society's boring at Zagazig, in the delta of the Nile, reports that a depth of 308 feet 6 inches has been reached. The soil from 190 feet has been sand, varying in coarseness, and sometimes mixed with stones. At 308 feet, 4 inches of blue clay was passed through.

The *Nation* of September 22 prints a letter from Miss Mabel Loomis Todd on the Eclipse Expedition in Japan. Miss Todd's letter is dated Shirakawa, Japan, August 20. We regret to find that the weather was not more favourable for observers in Japan than for observers in Russia and Germany.

We have received the fourth volume of the Proceedings and Transactions of the Royal Society of Canada. It contains the Proceedings and Transactions during the year 1886. Most of the papers are in English, but some are in French. Among the more important papers we may note "The Right Hand and Left-handedness," and "The Lost Atlantis," by Dr. Daniel Wilson; "The Genetic History of Crystalline Rocks," and "Supplement to 'A Natural System in Mineralogy,' &c.," by Dr. T. Sterry Hunt; "Some Points in which American Geological Science is indebted to Canada," and "On the Fossil Plants of the Laramie Formation of Canada," by Sir J. William Dawson; and "On certain Borings in Manitoba and the North-West Territory," by Dr. Geo. M. Dawson.

The October Bulletin of Miscellaneous Information, issued from the Royal Gardens, Kew, presents the results of a careful inquiry made by Mr. Arthur Shipley, under the auspices of the Royal Gardens, into a disease affecting the onion crop at the Bermudas. Mr. Shipley shows that the disease is caused by a fungus, *Peronospora Schleideniana*, which lives parasitically upon the leaf of the onion plant; and that the atmospheric conditions which favour the progress of the disease are heavy dews or rains, followed by warm, moist, calm weather, and the absence of direct sunshine and cold winds. In favourable weather the progress of the disease is very rapid. The fungus lives in the tissues of the leaf, choking up the air-passages and absorbing the nutritive fluid formed in the cells. Its stem protrudes through the stomata of the leaf into the air. Its branches bear spores at their tips. The reproduction of the fungus is effected by means of these spores, which float about through the air, and also by means of certain special cells formed by the fungus and known as resting-spores. These pass the winter in the earth, and are capable of retaining the power of germination for two or three years. It is by their means that the disease is carried on from one season to another. Mr. Shipley offers various practical suggestions, which will no doubt be of considerable service to cultivators.

Dr. Schweinfurth, in co-operation with Prof. Ratzel, is about to publish through Brockhaus, of Leipzig, a collection of all the letters and other writings of Emin Pasha. Dr. Junker also, in association with M. Richard Buchta, who visited the Upper Nile region some years ago, is about to issue a work dealing with the events of recent years in the Soudan. The volume will be illustrated with two maps, and have portraits of Gordon, Emin, Gessi, Lupton, and Slattin. Dr. Junker has just finished his work of preparing at Gotha the great map of his explorations in the basin of the Wellé and the region of the Upper Nile. It has been drawn by Dr. Hassenstein in four sheets, which will appear in the beginning of next year in a supplemental part of *Petermann's Mitteilungen*.

An elaborate work on palæontology ("Handbuch der Palæontologie") is being issued at Munich and Leipzig by R. Oldenbourg. The editor is Prof. Karl A. Zittel, of Munich, who is aided by Dr. A. Schenck, of Leipzig, and Mr. S. H. Scudder, of Boston. The work is divided into two parts, in the first of which palæontology is dealt with; in the second, palæophytology. The first part, when completed, will occupy three volumes; the second, one. The first two volumes have been published, and we have just received the first "Lieferung" of the third volume. The subject of this "Lieferung" (illustrated by 266 woodcuts) is "Vertebrata: Pisces." The subjects of the later "Lieferungen" of the same volume will be "Vertebrata: Amphibia, Reptilia, Aves, Màmmalia." We may mention that a French translation, by Dr. Charles Barrois, is issued simultaneously with the original German work.

A work on "The Cultivated Oranges and Lemons, &c., of India and Ceylon," by Brigade-Surgeon E. Bonavia, M.D., of the Indian Medical Department, is about to be issued. The writer's object is mainly practical and economical, but he deals also with some questions of purely scientific interest. His researches have brought him into contact with every variety of Citrus in India and Ceylon, and he claims that he has been able to dispose of, or at any rate to throw new light on, certain disputed points, both botanical and historical, in connexion with this genus. The book will be accompanied by an atlas in foolscap size, consisting of 259 plates of outline drawings of all the varieties of Citrus to be found in India and Ceylon.

Messrs. Dulau and Co. have now ready for publication "A Chapter in the History of Meteorites," by the late Dr. Walter Flight, F.R.S.

A third edition of "Weather Charts and Storm Warnings," by Mr. R. H. Scott, F.R.S., has just been issued. The writer's object in preparing the work was to convey some idea of the state of weather knowledge, so that readers might understand what was to be learned from a careful study of the weather charts in the newspapers and of the remarks appended to them.

The second edition has long been out of print. In the present edition the entire text has been revised, and some new chapters have been added, mainly relating to changes and improvements in the Meteorological Office work since the year 1876.

MESSRS. DE LA RUE AND CO. will publish shortly the second volume of "A Treatise on Electricity and Magnetism (Methods of Measurement and Applications)," by E. Mascart, Professor in the Collège de France, and Director of the Central Meteorological Bureau, and J. Joubert, Professor in the Collège Rollin. The work is translated by Dr. E. Atkinson, Professor of Experimental Science in the Staff College.

MESSRS. MACMILLAN will shortly publish a new edition of Huxley and Martin's well-known "Manual of Elementary Biology," considerably revised and extended by Messrs. Howes and Scott, Assistant Professors in the Normal School of Science and Royal School of Mines. To the new volume Prof. Huxley will contribute a preface.

A NEW way of utilizing dynamite has been lately devised by a French military engineer, M. Bonnetond. He uses the expansive force to drive out, for a brief period, the water from portions of wet ground in which foundations are to be made. The method is now in practice in the construction of a fortified *enceinte* at Lyons. A hole is first bored 10 or 12 feet deep, and about 1½ inch wide, in the wet ground. Into this is passed a string of cartridges of dynamite, which is then exploded. The water is thus driven far out beyond the sides of the cavity, over a yard wide, which is produced, and it does not reappear till after half an hour at least. The workmen thus have time to clear the cavity and introduce quickly-setting concrete. When the water returns it cannot injure the foundation. A rapid rate of progress is realized by this method.

A RECENT number of *La Nature* (September 17) has an illustrated account of a steam tricycle contrived by MM. Roger de Montais and L'Héritier, which will go 16 to 18 kilometres an hour with one person, and 14 to 16 with two. In front is a small boiler heated by petroleum, which gives off, it is said, no smoke nor smell, nor unpleasant heat. Under the seat is the petroleum reservoir, holding ten litres, enough to last ten hours, and behind is a water reservoir which holds thirty-four litres, allowing a two and a half hours' run without fresh supply. This water reservoir has one compartment for cold water, and another for water constantly heated by escape of steam; the latter feeding the vertical engine behind, and the former having steam turned into it at will.

IN a new galvanic battery, described by Herr Friedrichs in *Wiedemann's Annalen* (No. 9), a series of inverted bottle-shaped vessels have their necks connected by means of a horizontal tube, into which the exciting liquid (say dilute sulphuric acid and bichromate of potash) flows through a flexible tube from the lower part of a jar, which is raised or lowered to fill or empty the vessels. The liquid can also be let off through a cock at the further end of the connecting tube.

THE various Transatlantic and British fish hatched out this year by the National Fish Culture Association have prospered remarkably well at the establishment at Delaford Park. Some of the Californian rainbow-trout have grown to the extent of 4 inches, and the *S. fontinalis* produced from ova taken from two-year-old fish in the ponds have thriven in a similar manner. The landlocked salmon (*S. sebago*), despite their partiality to deep waters, are also doing well. The whitefish (*Coregonus albus*) have attained a length of 4 inches, and appear to be thriving better this year in consequence of their habitat having been deepened to suit their natural necessities. The cultivation of coarse fish is proceeding, a large quantity of fry bred from German carp being now in the ponds, besides other species.

AT the request of the Austrian Minister for Agriculture, Herr Putik has recently investigated the hydrography of Central Carniola, and given special attention to the Zirknitzer Lake. The phenomena of the periodical emptying and filling of this lake are very extraordinary; a gigantic cave, called Gilovca or Karlovca by the natives, and situated at the north-west corner of the lake, near Niederndorf, forms an outlet for the overflow. This cave lies at the foot of perpendicular rocks, and leads to a number of subterranean lakes, five of which Herr Putik has crossed. He is convinced that there are a great many more of these lakes.

IN the spring of 1885 a Society was founded in Hamburg for the establishment of plantations in Cameroon. Some 30,000 cocoa shrubs were planted, which are now 3½ to 4 feet high, and this year 40,000 more have been added.

ON Monday evenings in Michaelmas Term a course of lectures on "Climate and Weather" will be delivered by Mr. A. W. Clayden, at the City of London College, White Street, Moorfields, E.C. The lectures will be delivered in connection with the London Society for the Extension of University Teaching, and under the auspices of the Mitchell (City of London) Trustees.

A CORRESPONDENT of the *Indian Forester* communicates the following account of "a real weeping tree" to that periodical:—"On my way to and from the Mussoorie Library I have noticed for some days a small pool of water in the middle of the road just above 'Auchnagie.' It struck me as being something singular; and to-day when passing I noticed several drops of water fall into it; on looking up I saw that it was the sap from a branch high up on a tree that was falling into it; the drops were large and were falling at the rate of one a second. I afterwards noticed several other trees of the same kind on the roadside dropping sap from their branches in the same way. The tree is a large one, called by the natives Kágashi (*Cornus macrophylla?*). In the spring, if the bark of this tree is wounded by an axe, the sap runs out of the wound in a great stream; some of it solidifies into a thick mucilage of a bright orange colour; it was from a broken branch that the sap was coming, broken most likely by the heavy fall of snow we had at the end of January. These trees are just bursting into leaf, but they have been weeping for the last ten days at least."

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus* ♀) from India, presented by Mr. H. R. Sherren; a Leopard (*Felis pardus*) from Ceylon, presented by Mr. W. Mauger; a Guilding's Amazon (*Chrysotis guildingi*) from St. Vincent, West Indies, presented by Mrs. Ellice; a Pheasant (*Phasianus colchicus*), British, presented by Mr. A. L. Sawer; a Common Toad (*Bufo vulgaris*) from Gloucestershire, presented by Mr. John Scovell; a Chinchilla (*Chinchilla lanigera*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

PROPER MOTION of LL 26481.—Mr. John Tebbutt (*Observatory*, 1887, October, p. 360), having found a considerable discordance between the places given for this star by Lalande and Lamont, asked Mr. Lenehan, the acting Government Astronomer at Sydney, to observe the star with the transit-circle of that Observatory. The result of his observations, as will be seen, shows that the star has a large proper motion in both elements:—

		Mean R.A. 1886·0.				Mean N.P.D. 1886·0.		
		h.	m.	s.		°	′	″
Lalande 1800	...	14	25	1·06	...	105	6	33·4
Lamont 1850	...	14	25	2·17	...	105	6	56·6
Lenehan 1887	...	14	25	2·67	...	105	7	14·2

THE WASHBURN OBSERVATORY.—The fifth volume of the Publications of the Washburn Observatory of the University of